What is Alzheimer's? Brief overview/History - Presentation of Problem

Narrator:

Hello,my name is Seda. I'm Michelle. I'm Joey.

Welcome to our podcast. Today we'll be talking about Alzheimer's.

So Seda, what's the big deal about Alzheimer's?

Well, elderly populations in the Americas are expected to increase to 137 million people in the next 30 years (Alzheimer's Association, 2010) . By 2035, there will be more older adults than kids in The United States. These numbers are important because as the elderly population increases disease that come with age also will increase. For example, we will see a lot more people with Alzhimer's in the upcoming years. Alzheimer's disease is the most common neurodegenerative disorder and the sixth most common cause of death in the United States. What's interesting to note about Alzheimer's is that Alzheimer's is actually present in higher rates in African American and Latino populations (Weuve et al 2018; Gelman 2010). The cause of this difference in Alzheimer's is important because the population of elderly African American and Latino populations is also increasing in the United States (Chin, Alexander L et al., 2011). So why does this difference occur? And what does it mean?

To understand this problem, we first need to dig into a little more about what exactly Alzheimer's is. So what is Alzheimer's?

Alzheimer's disease is a brain disease that causes dementia- a loss of mental skills that impact daily life. People with Alzheimer's experience difficulties with memory, problem solving, doing

familiar tasks, and communication (Alzheimer's Association, 2010). It more often affects individuals over the age of 65 (Guerreiro & Bras, 2015). It is the most common cause of dementia. Many factors can affect a person's risk for Alzheimer's including aging and lifestyle factors (many of which we'll discuss later on), but the exact cause(s) are unknown.

The disease starts off as mild forgetfulness or small changes in brain function, emotion, behavior, and personality. It can progress into loss of movement, loss of ability to take care of self, loss of awareness of surroundings and widespread brain cell loss. Although a number of interventions exist to treat and manage symptoms, there is no cure for the disease and it is irreversible ("Alzheimer's Disease Fact Sheet" 2019).

How do doctors identify it?

Well Joey, that's actually a really interesting problem.

Specialists can detect dementia by giving patients tests and questionnaires, and by asking loved ones if they have noticed any significant changes.

Because there are many different diseases that cause dementia, doctors diagnose Alzheimer's disease by excluding other possible explanations for a person's symptoms. For example, dementia can also be caused by different conditions other than Alzheimer's, such as stroke, parkinson's disease or problems with providing enough blood to the brain (Frota, Norberto Anízio Ferreira et al. 2011). Doctors typically look at a patient's medical history and do urine and blood tests to make sure it is not something else (Sauer, Alissa, 2019)

Alzheimer's is associated with the build up of proteins in the nervous system which are called Amyloid beta plaques and tau tangles (Lee et al., 2019). We'll discuss later how these the two play a role in Alzheimer's disease and its symptoms, but for now just know that they are important.

Before brain imaging became available in the 1990s, doctors could not confirm that someone's dementia was caused by Alzheimer's disease until after death. This is because there was no way to see whether someone had Amyloid beta plaques or tau tangles without cutting their head open and looking in their brain (de Paula et al., 2009). Now with new imaging techniques proteins can be found decades earlier in a person's life, even before a person starts showing any symptoms. This has made it much easier to identify and treat Alzheimer's before it has gotten severe, making the treatment for patients generally more manageable (Lee et al, 2019).

Narrator:

Let's learn more about these proteins that are present in people with Alzheimers. As we mentioned before, if you were to look into someone's brain who has Alzheimer's, you'd see amyloid beta plaques and tau tangles.

Scientists aren't exactly sure what the purpose of amyloid beta is in the brain; however, they think that plaques form because the body has problems clearing amyloid beta from the brain (de Paula, Guimarães, Diniz, & Forlenza; 2009). Amyloid beta plaques are thought to be toxic to brain tissue. Tau is a protein that is involved in cell structure and stability. Tau tangles form when tau has a lot of phosphate groups added to the protein. While tau is a really important protein in the brain, the addition of phosphate groups to tau protein can negatively affect

stabilization of brain cells and communication between brain cells (Tan et al., 2009) The effects are decreases in chemicals in the brain that help with memory, learning, and muscle movement. Accordingly, patients with Alzheimer's typically show loss of function in areas throughout the brain including the hippocampus, which is responsible for learning and long term memory and the frontal lobe which is responsible for short term memory, planning, and social behavior (Breedlove, Rosenzweig, & Watson, 2010; Yong, Zhang, Gaolang & Evans 2009).

These two proteins are important because doctors are using these proteins to indicate someone's risk for the disease and how severe the progression of the disease might be (Lee, J.C. et al, 2019)

Narrator:

As we mentioned before, Alzheimer's disease does not all affect all communities equally. Black individuals are twice as likely as white individuals to develop Alzheimer's while non-white Latinos are 1.5 times as likely as white individuals to develop the condition (Weuve et al 2018; Gelman 2010).

According to the US Census Bureau, older adults are expected to make up 47% of the US population by 2060. This makes it likely that the number of people with Alzheimer's in the United States will double by then, according to Center Disease Control and Prevention. By 2060, the disease is expected to disproportionately affect ethnic minorities. The number of latinos with Alzheimer's disease is expected to reach 3.2 million, while the number of black individuals with Alzheimer's is expected to reach 2.2 million (Alzheimer's Association 2010).

From one perspective it may seem that Alzheimer's is more common in ethnic minorities because of inherent susceptibility. In other words, it may be that being of a certain race or ancestry might appear to cause Alzheimer's, or at least increase its risk. On the other hand, maybe it's because these groups are making up more of the nation's population; after all aren't latinos the fastest growing ethnic minority? (Gelman C. R., 2010) Although these ways of thinking about race and Alzheimer's are popular, we argue that the relationship between race and Alzheimer's is actually more nuanced.

Racial and ethnic minorities might have higher rates of Alzheimer's disease because of social factors. Black and Latino individuals are historically disenfranchised groups who have been targets of political and social adversity stemming from a history of colonization and slavery. This disenfranchisement has informed the circumstances that different racial groups have experienced in the past and today. Some of these circumstances have put minorities at risk for Alzheimer's disease. For example, having more years of education is associated with a decreased risk for Alzheimer's, the same is true for being of a higher ranking position in one's job or field. Black people and latinos in the United States have experienced systemic roadblocks that have kept them from participating in quality education alongside white students (Blakemore, 2018; Pellegrino, 2013). Before the 1960s, educational segregation on the basis of race or ethnicity was legal and socially acceptable. This allowed states to discriminately teach white children and children of color in separate schools; schools meant for children of color were given disproportionately less funding from the state than schools meant for white children (Pellegrino, 2013). High education such as colleges and universities have had a similar discriminatory history, which has shaped the number of people of color in professional high paying fields.

Along with this, as well as employment discrimination, many communities of color are low income and have limited political power and resources in their areas.

What is race?

Narrator:

Let's dive deeper!

What is race? Race is a social construct that has been used as way of dividing humankind into different categories. Though race is a social construct, race is a concept that is often used in research. Scientists often study racial disparities. This means that there are differences in rates of disease between races. Alzheimer's disease is an example of a racial disparity. As we mentioned before, Alzheimer's disease has been found to be 1.5 times more likely in Latinos and 2 times more likely in African Americans (Weuve et al 2018; Gelman 2010). However, should scientists even use race as a research category? Does using race to study Alzheimer's disease tell us anything meaningful, like a potential cure or a cause? Or is race a confounding variable?

We argue that race as a "biological" concept is not a good way to understand how risks of Alzheimer's are distributed among groups. However, race is an important social construct that is associated with a number of lifecourse variables such as access to education, healthcare, and experiences of racism, discrimination, and poverty (Feagin & Bennefield, 2014). We think it is important to look at the sociohistorical impact of race in order to explain how the experience of Alzheimer's is different in ethnic populations compared to white communities.

Narrator:

There are many numerous studies about race and Alzheimer's. However, differing definitions of race and the mixing of different ethnic populations throughout our species history has made deciding which race a person belongs to is not a biologically precise task. Many groups do not fit neatly in socially constructed racial categories. First, Latinos and African Americans often have mixed lineage. A study of African Americans found that many had European genes; some had Native American genes (Bryc, K. et al. 2015). Latinos are often a mixture of the Spanish, African, and native peoples in the Americas (Bryc, K. et al. 2015). Second, even though in this podcast we have used the terms Latino and Hispanic interchangeably, there is actually a difference between Latino and Hispanic. Latinos refer to people from Latin America, while Hispanic refers to people who speak Spanish or are descended from Spanish speaking populations (Vega, Irving et al. 2017). These issues in definition leave the question: when we are studying race, what variable are we actually looking at?

Genetics

Narrator:

One way of understanding race is as a proxy for certain genetic traits. An example would be race and the sickle cell anemia. Sickle cell anemia is a disease caused by sickle shaped red blood cells which can cause infection, pain and fatigue. The sickle cell allele is present in the population because its presence helps protect against malaria (Piel, Frédéric B., et al, 2010). Sickle cell anemia is considered by some a black disease, because the allele is more prominent in those whose ancestors lived in Africa. However, the concept of the sickle cell allele as a black gene

can lead to some misconceptions. The sickle cell allele is better defined as a gene associated with frequency of malaria (Piel, Frédéric B., et al, 2010). Only certain areas of Africa have a high frequency of malaria. Additionally, some areas in India have a high frequency of malaria (Piel, Frédéric B., et al, 2010). These areas with a high frequency of malaria are associated with sickle cell disease, not the entire black population. This means that race isn't a very good proxy for genetics.

This same concept can be applied to Alzheimer's disease. While there are some genes such as ABCA7 which scientists say are associated with Alzheimer's risk in African Americans, the sickle cell allele case demonstrates that people should remain cautious about correlating genes with race (Berg, Sinha & Gluck, 2019).

Impact of Physical Environment exposure to toxins on AD

Narrator:

So what other factors may be encompassed by the variable of race? In America, people from different races can be exposed to different environments. Environment can also interact with genetics to affect disease risk. Because of issues like environmental racism, areas with minority populations may have a higher risk of Alzheimer's diseases because of the toxins, pollutants or chemicals present in the area. Air pollution has been linked to Alzheimer's (Moulton & Yang, 2012). This is relevant because researchers embedded in the EPA's National Center for Environmental Assessment released a study indicating that people of color are much more likely to live near polluters and breathe polluted air (Newkirk, Vann R., 2018).

Certain jobs may have a higher exposure rate to chemicals than other jobs. For example, farmers and gardeners may have a higher exposure to pesticides. Workers in agricultural jobs such as farmers are disproportionately of Latin American descent from countries such as Mexico, El Salvador, and Haiti. Because pesticides are often neurotoxins, some studies have found that pesticides may increase the risk of Alzheimer's (Yan, Dandan, 2016).

Environmental stressors throughout someone's lifetime can affect gene expression which can cause AD (Vick & Burris, 2017). It is important to consider the life stressors that one may face growing up in a region with many air pollutants.

Poverty & Education

Dr. Lourdes Guerrero is an Assistant Professor in the School of Medicine at UCLA. She completed her doctorate in Educational Leadership at UCLA. She also completed her Masters in Social Work. She is the Associate Director for the Geriatric Workforce Enhancement Program (GWEP) and TimeOut@UCLA, which is an intergenerational respite program for caregivers of individuals with Alzheimer's and dementia. She states that in addition to educational attainment, occupational attainment, and physical inactivity "other under-studied areas are the role of stressors (like exposure to violence and trauma)… can impact brain development and health." She states that "Poverty in general makes people more vulnerable to negative health outcomes" and thinks poverty and education are important "to consider when looking at AD diagnosis and outcomes." (Guerrero, Interview)

Dr. Guerrero brings up an important point about poverty playing a major role on Alzheimer's diagnosis and outcomes. Poverty brings many stressors to someone's life, which can affect the

probability of developing Alzheimer's (Lemche E., 2018). Since environmental factors potentially affect the development of the disease, regardless of what someone's racial makeup may be, it may be more useful to consider geographic regions rather than race when creating categories for Alzheimer's research which attempts to understand environmental differences. By looking at variables such as geographic regions or stress of occupations, we can focus more on preventing and making improvements to Alzheimer's rather than studying race. Instead of focusing on a race as a way to address disproportionately of Alzheimer's in different groups, it may be more important to focus on wider systemic legislative changes. This may include increasing access to education, reducing environmental pollutants and decreasing overall stress.

Environment can be expanded to include social factors and not just physical aspects of the environment. As we mentioned before, the education system in the area may affect risk of Alzheimer's. Furthermore, lack of access to medical and dental care can affect risk of Alzheimer's. For example, bacteria that causes gum disease has recently been linked to Alzheimer's (Kramer, Angela, 2009). Because dental care often isn't covered by insurance (for example Medicare doesn't cover dental insurance), many American's go without dental care and dental check ups (Jordan & Sullivan, 2017). The lack of dental care can contribute to increased risk of Alzheimer's. Additionally, many rural areas often lack health care coverage. Rural areas are also associated with an increased risk of Alzheimer's (Hall, K.S, et al., 2000).

Socioeconomic Status

Narrator:

Socioeconomic status seems to explain the prevalence of many diseases. For example, cardiovascular disease and diabetes are both associated with higher rates of Alzheimer's and low socioeconomic status. Low SES is also associated with high blood pressure, inflammation, and clogging of the arteries and dementia (Gylmour & Manly 2008).

Allostatic load can be thought of bodily wear and tear from chronic or extreme stress in the form of cardiovascular, metabolic, and psychiatric disease. Low SES individuals and ethnic minorities are thought to experience more bodily wear and tear that is due to higher exposure to social adversity (Geronimus, Hicken, Keene, & Bound 2008).

The “Weathering” hypothesis posits that people of color experience increased allostatic load through high exposure to interpersonal discrimination, racism, and social, political, and economic adversity (Geronimus, Hicken, Keene, & Bound 2008).

Narrator:

Socioeconomic status, along with an individual’s culture may also inform how they choose to cope with a stressor. Adversity by definition is stressful, and some experiences can take toll that require medical intervention (Lemche E., 2018). Some forms of coping such as psychological therapy require access to medical care and can be costly without insurance leading to health damaging behaviors that may contribute to Alzheimer’s. Furthermore, low SES individuals are also less likely to seek medical treatment and more likely to overlook symptoms when they are present (Geronimus, Hicken, Keene, & Bound 2008).

Minorities Alzheimer's research

The participants used in Alzheimer's clinical research have been primarily white, making it hard to extrapolate findings to real life (Darnell, Kathryn R et al., 2011; Gilmore-Bykovskyi et al. 2019). We asked Dr. Guerrero about the state of representation and inclusiveness in Alzheimer's research. We specifically asked if current researchers are doing a sufficient job at recruitment of diverse samples.

She stated:

"Definitely not!" "... There is a push to recruit more diverse populations into [Alzheimer's] research, but this is definitely more time consuming than 'traditional' recruitment, which oftentimes means these groups are not included". "Some of this is due to researchers prioritizing getting the data faster versus recruiting a diverse sample (which may take longer)".

For Dr. Guerrero, there are definitely social and cultural aspects that make recruitment of diverse groups an issue. Researchers may find it difficult to communicate and accurately assess individuals who have primary languages different from English such as Spanish or Chinese.

According to Dr.Guerrero: "there are also issues of lack of trust among community members and lack of understanding of research in general".

Historically, black communities were targets of unethical medical and military research, which has left a mark of distrust on the research and medical establishments (Feagin & Bennefield,

2014). The lack of representation in research samples may also come from a lack of cultural competence during recruitment.

Summary

Narrator:

Race may play less of a factor in risk for Alzheimer's, but racism and culture can affect how people experience Alzheimer's. Though race is a social construct, racism has very real consequences. Minority populations often face discrimination and implicit bias by physicians (Feagin & Bennefield, 2014). Furthermore, minority populations may feel uncomfortable disclosing information to their healthcare provider because of the long history of racial abuse by the medical community (Feagin & Bennefield, 2014). Lack of access to culturally appropriate care can also decrease quality of care (Chin, Alexander L et al., 2011). This idea can help us understand that while racial differences in health are called health disparities, they may be better understood as health inequalities. More needs to be done to address differences in access to healthcare and treatment by healthcare providers.

Different cultures can affect how people experience Alzhiemer's. Different concepts of aging lead to different ideas of what normal aging is. For example, a study suggested that African Americans tend to view the symptoms of Alzheimer's as more similar to the signs of early aging (Chin, Alexander L et al., 2011). However, religious views may change how people view Alzheimer's, as some may view the onset of Alzheimer's as an act of God (Chin, Alexander L et al., 2011). Additionally, caretakers of Alzhiemer's patients can change how the disease is

experienced. Within minority communities, Alzheimer's patients are more likely to be taken care of by family members (Napoles, Anna M et al., 2010).

These concepts help us understand that though racism and culture plays a part in understanding how Alzheimer's is experienced, race is not a good biological variable for understanding differences in Alzheimer's risk. However, that doesn't mean that more diverse populations aren't needed in Alzheimer's research.

Additionally, more needs to be done to prevent Alzheimer's on a larger level. Decreasing pollutants, increasing access to education and decreasing poverty can all help to decrease Alzheimer's risk. Additionally, addressing issues of racism in healthcare fields can help prevent the racial inequalities in care for minority patients. To address the large problem of Alzheimer's in the community, we need to address the diverse population in America and make systemic changes to better protect future generations against this devastating disease.

Thank you for listening to our podcast. We hope you learned a lot.

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